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Annual Report: Fiscal Year 2009

University of Tennessee Office of Research

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THE UNIVERSITY of TENNESSEE  KNOXVILLE

QUEST

Research, Scholarship, Creative Activity

RESEARCH Annual Report

Fiscal Year 2009

Stimulus/Response

A classic concept in zoology and animal behavior, in anatomy, in psychology and human behavior, in statistics—

A stimulus is applied: a neuron is poked, the environment is tweaked, *x* is changed.

There is a response: the organism twitches, a cell responds, *y* assumes a different value (with luck, a predictable one).

The stimulus/response concept is central to so many scientific endeavors, to so many vital human activities.

Stimulus/response is at the heart of the research agenda at the University of Tennessee, Knoxville. The stimulus may take the form of a societal need for better childcare or an organization's drive toward more efficient operation. Inequities in opportunities for postgraduate education may stimulate programs to relieve the inequality. Even basic science-driven curiosity may energize an exploration into how a particular part of the world works.

Stimulus/response is not only at the heart of the scientific method; it is also the pattern by which the University of Tennessee's flagship campus approaches its three-fold mission of education, research, and public service. In Fiscal Year 2009, these are some of the university's responses to the challenges with which its faculty was presented.

Continuous Process Improvement in Air Force Acquisition

Stimulated by a need for leaner operations to boost its efficiency, the U.S. Air Force has turned to the UT College of Business Administration's Center for Executive Education for leadership training that is transforming the Air Force's way of doing business. Using the expertise of UT research faculty and retired military and industry executives, [Alex Miller](#), associate dean of the college, has assembled three courses that are helping the service improve its mission performance and reduce its costs. One six-month course trains selected personnel in Smart Operations for the 21st century. Every general or civilian executive in the Air Force has taken or will be taking an intensive two-day course that hones his or her leadership skills for driving the lean-operations transformation. In FY 2009, the Air Force supported the program with more than \$16 million and is expected to expand its participation in FY 2010. <http://thecenter.utk.edu/>

Blackjack: Evaluation of Architecture-Aware Compiler Environments

The Defense Advanced Research Projects Agency has also turned to the university for research and development in advanced computing projects. DARPA, which was instrumental in developing the earliest stages of the Internet, is creating compiler programs that will self-adapt to the computer systems on which they are employed. [Jack Dongarra](#), UT Distinguished Professor of Computer Science, who made his mark on the computing world when he created the yardstick now used to measure the world's top 500 supercomputer sites, is applying his benchmarking abilities to a program that will evaluate the performance of the new compilers created in the four-year DARPA program. Under an award valued at almost \$2.6 million called Blackjack, Dongarra and colleagues are developing metrics that will measure a new generation of compilers that are self-aware—that can “sense” the computer architecture on which they are installed.

<http://icl.cs.utk.edu/blackjack/>

Program for Excellence and Equity in Research

In response to the need for more Ph.D. students from underrepresented minority groups in STEM disciplines, [Cynthia Peterson](#), head of the Department of Biochemistry and Cellular & Molecular Biology, [Carolyn Hodges](#), vice provost for the graduate school, and an array of scholars

and researchers from UT and Oak Ridge National Laboratory have embarked on PEER, the Program for Excellence & Equity in Research. With \$3.9 million in support from the National Institutes of Health, PEER integrates interdisciplinary research, mentoring, and professional activities to enhance the education of a select group of young scholars who represent the next generation of bioscientists. PEER affiliates include the UT/ORNL Graduate School of Genome Science & Technology and various departments at UT. The program provides financial support for the first two years of study in a Ph.D. program and a team of mentors for each class of PEER scholars. <http://web.utk.edu/~peer/>



Childcare Assessment Supportive Services

Sometimes the stimulus is a need on the part of the people of Tennessee, and the response is the way University of Tennessee scholars and researchers answer that need. In the Social Work Office of Research and Public Service, [JoAnna Cheatham](#), [Maryanne Cunningham](#), and [Bingham Graves](#) administer a \$2.3-million program that studies the quality of childcare on behalf of the Tennessee Department of Human Services. Cheatham oversees an array of assessment and training services for the state Childcare Evaluation and Report Card Program, which is required for all licensed childcare providers in Tennessee. The group also sponsors the Star-Quality Program, a voluntary way childcare providers can be identified publicly as meeting higher standards of quality. Tennessee is the only state that assesses the program environment of every DHS-licensed childcare agency on a yearly basis, and Cunningham and Graves maintain an extensive database that charts assessment scores and allows the state DHS to evaluate progress and problem areas in childcare. Now Cunningham, Cheatham, and company find themselves in demand at national conferences because their efforts have helped Tennessee lead the nation in evaluating childcare quality. More importantly, the meticulous assessments show that yearly evaluations and consultations are bringing about concrete improvements in childcare programs and the qualifications of individuals who work in them. Because of this program, children in Tennessee are safer and better cared for than they were eight years ago.

http://www.tnstarquality.org/html/report_cards.htm

Southeastern Transportation Center

The University of Tennessee is the lead institution in the Southeastern Transportation Center, a program of the U.S. Department of Transportation. [Steve Richards](#), a faculty member in UT's Department of Civil and Environmental Engineering, is the director of the center, which receives \$1.8 million in U.S. DOT funds to train professionals to address the transportation needs of the region, with a special emphasis on comprehensive transportation safety. The center matches up talented students with programs in STC universities around the region and also funds technology transfer and research activities that contribute to its mission. <http://stc.utk.edu/index.html>

Brief Intervention to Reduce Drinking and Intimate-Partner Violence in Women

[Gregory Stuart](#) is looking at ways to intervene in a different stimulus/response interaction. Stuart has a \$2-million award from the National Institute on Alcohol Abuse and Alcoholism to study whether violence between intimate partners can be reduced by having batterers take alcohol intervention programs. Stuart, who joined the faculty of the Department of Psychology in 2008, has found in previous research that programs to counsel men who batter their domestic partners are not effective at preventing a return to the violent behavior. Often substance abuse plays a role in the dynamic between batterers and their victims, so Stuart's current clinical trial involves testing whether a brief class on alcohol abuse will improve the effectiveness of training sessions against domestic violence. If the clinical trial shows success, he is considering seeking support for a similar program that would target students engaged in hazardous drinking behaviors, which also can lead to physical and sexual violence. <http://www.higherground.utk.edu/2009/04/smashed/>

... and Other Stimulus/Response Reactions

Sometimes the stimulus is simple curiosity, an itch to know, a desire to fit in the last piece of the puzzle. That's what drove [Zi-Ling Xue](#), professor of chemistry, to continue experiments to identify the intermediate molecular stages of a little-known chemical process that has proven crucial to 21st-century chemical engineering. In 2005, Richard Schrock shared a Nobel Prize in chemistry for discovering the compound tantalum alkylidene, which is a catalyst for changing olefin compounds (including petroleum) into chemical products that are useful in manufacturing medicines and polymer fuel enhancements.

Though the catalyst was famously successful and became commercially available in 1990, researchers have not been able to identify the molecules that form as the metathesis takes place. Earlier this year, Xue and co-researchers [Julia K.C. Abbott](#) and [Liting Li](#) successfully identified a complex molecule—pentaneopentyltantalum—as the missing compound that leads to creation of the catalysis. The results were published in the *Journal of the American Chemical Society* and covered by *Chemical & Engineering News*.



Curiosity was also the stimulus for [Mingjun Zhang](#) to undertake recent studies of the mechanisms by which ivy clings to seemingly impervious surfaces of stone and metal. Zhang, an associate professor of biomedical engineering, was watching his young son at play when his attention was drawn to an ivy-covered wall. When he subjected ivy stems to analysis under an atomic-force microscope, he discovered that as the tendrils touch a surface, the plant is stimulated to release nanoparticles that penetrate each miniscule gap and flaw in the hard surface, creating one of the strongest bonds in nature. Zhang and UT colleagues have responded to the discovery by seeking practical uses for the clinging mechanism, including possible medical applications for wound closure and drug delivery, military developments that might let soldiers scale vertical surfaces, and coatings that might prevent clinging creatures like barnacles from attaching to naval equipment.

The UT College of Law continues to rate highly among law schools that post papers to the Social Science Research Network, which publishes articles on several specialized electronic networks. As recently as mid-August, UT ranked No. 1 in a tie with Harvard in the number of new downloads per paper. That ranking indicates that, on average, each UT article published to the SSRN database was downloaded 86 times, an average that ties the Harvard University Law School's average as highest. [Gregory Stein](#), College of Law associate dean for faculty development, said that SSRN statistics show almost 14,000 people have downloaded papers prepared by UT law faculty in the last year. "That means our publications are having a real impact in the legal community and elsewhere," Stein said. SSRN tables show that the UT College of Law has ranked either first or second in this measure since February 2007.

Important sources of support for scholarship in the humanities have responded to the scholarship of UT faculty members. In Fiscal Year 2009, [David Reidy](#) (philosophy), [Heather Hirschfeld](#) (English), [Millie Gimmel](#) (modern foreign languages and literatures), and [Gregor Kalas](#) (history of architecture) have been supported by the National Endowment for the Humanities. [Palmira Brummett](#) (history) and [Christine Shepardson](#) (religious studies) won support from the American Council of Learned Societies. [Jered Sprecher](#) (studio art) received a Guggenheim Foundation Fellowship, and [Dawn Coleman](#) (English) won a fellowship from the American Academy of Arts and Sciences.



Streamlining and specializing

The UT Office of Research began a comprehensive reorganization and enhancement of resources in FY 2009 in an effort to encourage more faculty participation in sponsored programs. The office completely restructured its sponsored programs unit and created a proposal development operation that is already invigorating the process of pursuing awards. The result—an increase in efficiency and effectiveness in the pursuit of external funding—is an opportune development as faculty interest in pursuing opportunities has been increasing, and the bleak economic conditions of FY 2009 have given rise to the American Recovery and Reinvestment Act of 2009, a federal stimulus effort that opened up broad new research opportunities nationally.

To capitalize on both these factors, the Office of Research has added staff that will—for the first time at UT Knoxville—specialize in technical assistance to improve the success rate of faculty submissions and enable the coordination of large, multidisciplinary proposals. The office has put in place a proposal development team that includes two project managers, a director of research development, a proposal development director, a sponsored programs liaison, and two editors/writers—all of whom have the responsibility of supporting the complex tasks of submitting multidisciplinary proposals. Other staff focus on identifying new sources of funding opportunities and publicizing them. The office is also putting new emphasis on faculty and staff development, offering training in everything from the basics of UT and agency paperwork to the fine points of crafting effective proposal documents and navigating the intricacies of agency programs.

Recognizing that the ability to process proposals in an accurate and timely matter is crucial to winning awards, the office has retooled its sponsored programs operation. Two new assistant director positions were created under the director of sponsored programs. The assistant director for proposals oversees a staff of negotiators who facilitate the interaction between faculty proposers and the agencies whose funding opportunities they are responding to. The assistant director for contracts manages a staff of negotiators who attend to details of the legal documents that result when awards are made by funding agencies.

Quest, the Office of Research communications initiative begun last year, continues to develop new ways to inform faculty and staff within the university and the external publics who benefit from knowing about UT's research agenda. Recently off the press is the first edition of the *Quest Catalog of Research*, which highlights the various centers, institutes, laboratories, and other programs that are the heart of University of Tennessee research. The catalog is expected to be an access point for internal personnel as well as an introduction for potential research collaborators and investors from across the nation. The office's research magazine, *Quest—Research, Scholarship, Creative Activity*, is completing its first full year of highlighting the accomplishments of the university.



Stimulating undergraduate research

In 2009 the Office of Research gave special attention to encouraging University of Tennessee undergraduates to participate in research.

Some 250 students prepared 183 entries in the annual Exhibition of Undergraduate Research and Creative Achievement, a celebration of undergraduate research, scholarship, and creativity that is now well into its second decade at the university. More than 85 students were honored for 42 entries at EURECA in spring 2009.

On behalf of the Chancellor, the Office of Research also administered 77 undergraduate summer internships in summer 2009, allowing the students to work for two months with faculty mentors on research and creative projects.

Publications and other activities will further spotlight undergraduate work in FY 2010.

Selected Honors

University of Montana
Bliss Award for Distinguished Broadcast Journalism Education
Sam Swan, College of Communication & Information

Environmental Protection Agency
National Sustainable Design Expo Top Award
Tricia Stuth, College of Architecture & Design
Tim Ezzell, Institute for a Secure & Sustainable Environment

Fulbright Program, U.S. State Department
Teaching & Research Award
Bonnie Callen, College of Nursing

Guggenheim Foundation
Guggenheim Fellowship
Jered Sprecher, School of Art

College Language Association
Outstanding Book Award
La Vinia Jennings, English

Norton Anthologies
The Norton Anthology of Drama, co-author
Stanton B. Garner, Jr., English

Fulbright Program, U.S. State Department
Fulbright Scholar
William J. Dewey, School of Art

American Academy of Arts & Sciences
Visiting Scholar, 2009–2010
Dawn Coleman, English

American Council of Learned Societies
Fellowship
Christine Shepardson, Religious Studies

Conference of Latin American Geographers
Preston E. James Eminent Latin Americanist Career Award
Lydia Pulsipher, Geography (Emeritus)

Langum Charitable Trust
Langum Prize in American Legal History
Ernest Freeberg, History

National Science Foundation
CAREER Award
Xiaorui Wang, Electrical Engineering & Computer Science

National Endowment for the Humanities
Faculty Fellowship
David Reidy, Philosophy

National Endowment for the Arts
Literature Fellowship in Creative Writing
Margaret Lazarus Dean, English

National Endowment for the Humanities
Faculty Fellowship
Heather Hirschfeld, English

American Institute of Aeronautics & Astronautics
General Henry H. “Hap” Arnold Award
Gary Flandro, UT Space Institute

American Philosophical Society
Jacques Barzun Prize in Cultural History
Thomas E. Burman, History

Society for Personality and Social Psychology
Early Career Award
Jim McNulty, Psychology

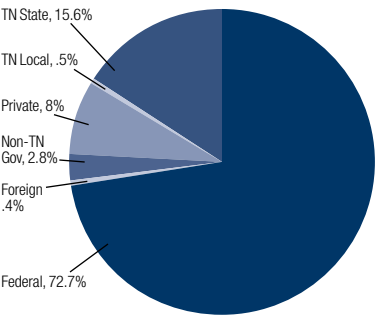


Jered Sprecher, Shadow Boxer
20" × 16", oil on canvas, 2009

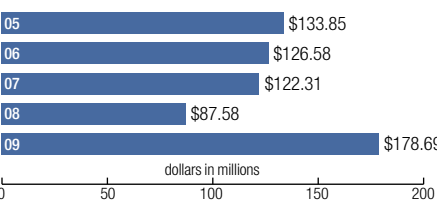


The New Norris House, designed to be buildable in the town of Norris, Tenn., and to fit within the architectural, technological, and environmental framework of the original Norris Project; it relies on advancements in ventilation, insulation, electric and solar thermal heating, plumbing, and lighting.

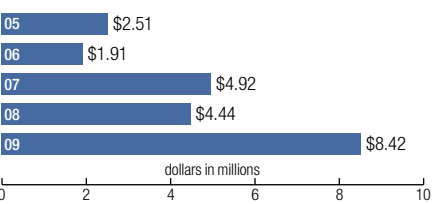
Expenditures from All Sources (FY 09)



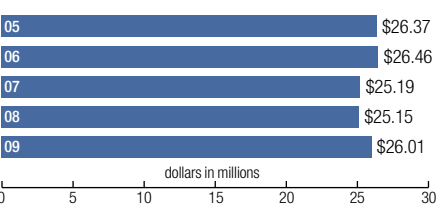
Sponsored Dollars Awarded (FY 05-09)



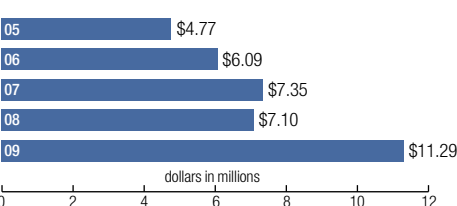
Five-Year Change in Sponsored Expenditures from Defense (FY 05-09)



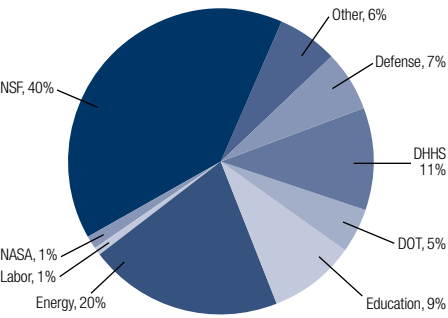
Five-Year Change in Sponsored Expenditures from Energy (FY 05-09)



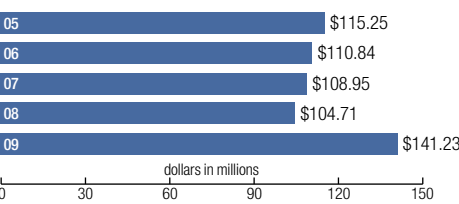
Five-Year Change in Sponsored Expenditures by Industry (FY 05-09)



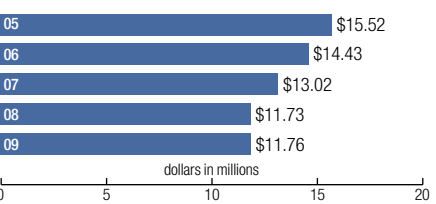
Expenditures from Federal Sources (FY 09)



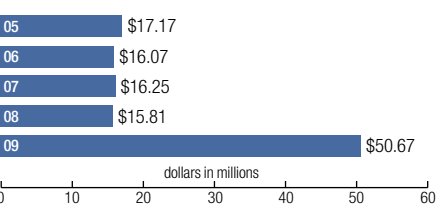
Five-Year Total Sponsored Expenditures (FY 05-09)



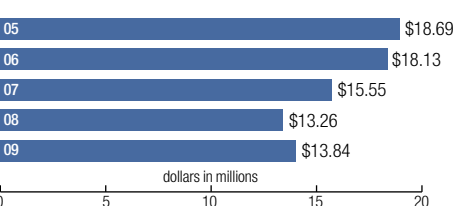
Five-Year Change in Sponsored Expenditures from Education (FY 05-09)



Five-Year Change in Sponsored Expenditures from NSF (FY 05-09)



Five-Year Change in Sponsored Expenditures from DHHS (FY 05-09)



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